Attachment 9

EDF-3318, Revision 0, In Situ Depth Profiling of Cs-137 Contamination in Soils at CERCLA Site Auxiliary Reactor Area 23, Operable Unit 5-12

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In Situ Depth Profiling of Cs-137 Contamination in Soils at CERCLA Site Auxiliary Reactor Area 23, Operable Unit 5-12

Prepared for:
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4. Summary: Pre-remediation characterization of the Cs-137 contamination in soils at the ARA-23 CERCLA site. Characterization activities included verification of the lateral extent of the contaminated area using the INEEL Global Positioning Radiometric Scanner. The vertical extent of the contamination in select areas of the site including the haul road and turn-around area, ARA-II facility, and the equipment washdown area. The vertical extent of contamination was evaluated with an in-situ gamma-ray spectrometer and depth discrete samples collected at 2-inch depth intervals down to a depth of 8 inches. A comparison was made between the depth distribution data from the in-situ spectrometric measurements and the physical, depth discrete samples and is discussed herein.

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In Situ Depth Profiling of Cs-137 Contamination in Soils at CERCLA Site Auxiliary Reactor Area 23, Operable Unit 5-12

1. INTRODUCTION

The Auxiliary Reactor Area (ARA) 23 site is a large, roughly oval-shaped windblown contamination site encompassing the Station Low-Power Reactor (SL) 1 Burial Ground and the remnants of the ARA-I and ARA-II facilities. The long axis of the site is consistent with the generally southwest to northeast winds common on the Idaho National Engineering and Environmental Laboratory (INEEL). Soils were radiologically contaminated by the 1961 SL-1 reactor accident and subsequent cleanup. Minor amounts of contamination may have been added by other ARA operations. Over time, winds dispersed the contamination over an area approximately 240 acres, as shown in Figure 1.

This Engineer Design File (EDF) presents the results of the year 2002 radiation surveys at the ARA-23 site. These measurements were done in order to refine the areas of Cs-137 contamination prior to scheduled remediation efforts at this site. The measurement effort consisted of three main components:

1. Drive-over measurements using the Global Positioning Radiometric Scanner (GPRS) system to cover large areas and locate those areas with above-background count rates.

2. High-resolution in situ gamma ray measurements using high purity germanium detectors at predetermined locations the ARA-23 site to quantify the Cs-137 concentrations at those locations.

3. Use of the in situ gamma ray spectra and analysis algorithm, and systematic soil core sampling and laboratory analysis of the cores in order to estimate the Cs-137 depth profile at several locations across the ARA-23 site.

2. FIELD SCREENING MEASUREMENTS

The screening measurements used for this survey are similar to those that have been used at other INEEL sites. The first type of measurements used at this site included drive-over measurements. The system used was a GPRS mounted on the front of a 4-wheel drive vehicle. The GPRS system was used to locate and document areas of high gamma activity. The GPRS detection system consists of two large, plastic scintillator detectors, which measure gross counts per second. The system records the gross counts per second data and the associated geographical coordinates in memory. The data is then processed using commercially available mapping software to produce contour maps of radiation levels for the surveyed areas. To translate the gross counts per second to concentrations, comparative laboratory-based data pertaining to the specific site is used to determine the radionuclide concentration in relation to the gross counts per second obtained using the GPRS. Such data exists for the ARA-23 site, but may not be directly applicable to GPRS measurements performed at other contamination sites at the INEEL (Josten 1997; Giles 2000). Figure 2 shows the INEEL GPRS system.

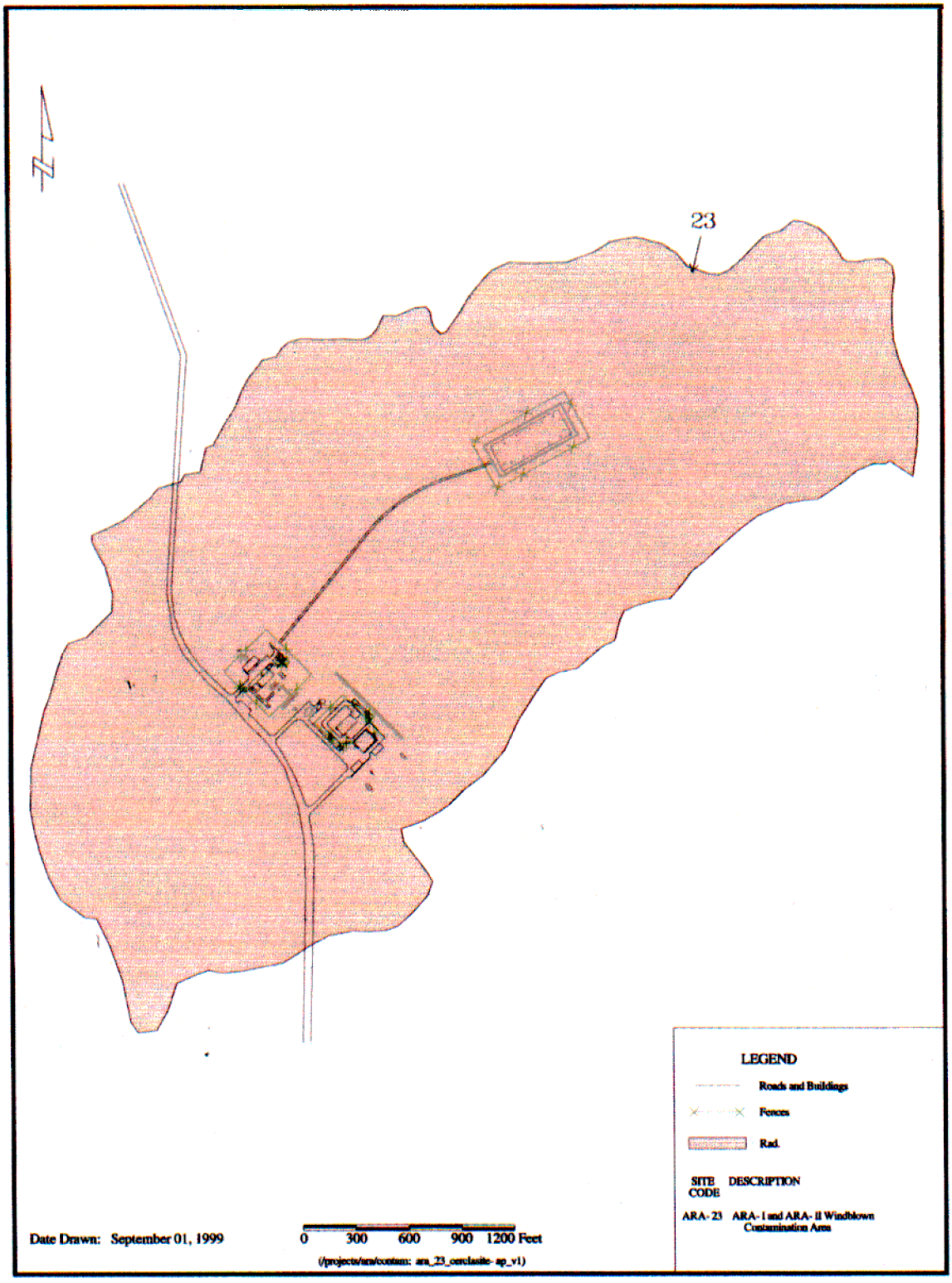

Figure 1. Auxiliary Reactor Area (ARA) -23 site.

Figure 2. INEEL Global Positioning Radiometric Scanner system performing a survey.

3. HIGH RESOLUTION GERMANIUM DETECTOR MEASUREMENTS

The second system used for this field measurement effort consisted of 65 and 70 percent efficient n-type high purity germanium (HpGe) detectors mounted 1 m (3 ft) above the ground on a tripod. A portable multichannel analyzer (ORTEC DIGIDART) system was coupled to the detector, and the system was controlled by a Panasonic CF47 field-rugged computer. The height of the detectors above the ground, 1 m (3 ft), facilitates an uncollimated field of view approximately 20 m (66 ft) in diameter. Figure 3 shows a typical field setup for the in situ germanium detector systems.

Figure 3. In situ HPGe spectrometer system positioned for field measurement.

Using in situ gamma ray measurement method, the gamma-emitting radionuclides are identified by their specific photon energies, which are registered as spectral peaks. The peak count rate is related to the full absorption of unscattered gamma rays. If the detector is properly calibrated, the activities per unit mass of any radionuclide can be derived from the peak count rate using parameters that describe the soil characteristics (i.e., density, etc.) and the depth profile of the distribution. The in situ technique is particularly well-suited for studies such as this because it quickly determines levels and types of contamination over large areas. Each measurement provides a weighted average over the detector field of view that is on the order of many square meters. The use of this technique to measure Cs-137 contamination in soils is well documented and has been used extensively at the INEEL (Beck et al. 1972; Gogalak 1981; Helfer and Miller 1988; ICRU 1994; Miller and Helfer 1985; Miller et al. 1994; Ryback et al. 1992).

Prior to starting the fieldwork, an energy calibration was performed on the high purity germanium detector at the Idaho Nuclear Technology and Engineering Center Gamma Spectrometry Laboratory. Field counts were obtained for 600 to 1800 seconds real time. Gamma ray spectra were analyzed using the ORTEC M1 analysis code. This code uses the GammaVision peak fitting and analysis algorithm

combined with the U.S. Department of Energy Environmental Measurements Laboratory (EML) M1 protocol. This method generally uses the most prominent gamma ray of a radionuclide to quantify the concentration present in the soil for an assumed depth profile. The user must specify an assumed depth profile for each spectrum analysis using the M1 protocol. These profiles are: (1) *planar*-used for cases of newly deposited fallout isotopes which have not been driven into the soil media by precipitation; (2) *uniform*-used for naturally occurring isotopes whose concentration is relatively constant with depth; and (3) *exponential*-used for anthropogenic isotopes deposited fairly recently or for those isotopes deposited in semiarid regions. For the exponential case, the concentration is related to soil depth as follows:

$$S=S_0\exp\{(-\alpha/\rho)\rho z\}$$

where:

S = activity per unit volume of soil at some depth z

S_0 = activity per unit volume at the soil surface

α = reciprocal of the relaxation length of the exponential distribution

ρ = soil density

z = soil depth.

This equation expresses the soil profile in terms of mass depth and the α/ρ term expresses the penetration of depth of the Cs-137 into the soil. As the α/ρ term approaches zero, the source distribution becomes uniform with soil depth; as the α/ρ approaches infinity, the distribution becomes a surface plane. The density of ARA soils at the INEEL is assumed to be 1.5 g/cm^3 based on previous soil analyses. For this work, the density was not adjusted for depth.

4. SOIL SAMPLING METHODOLOGY

In order to cover the field of view seen by the HPGe detectors, an approach was used which prescribed that samples be collected at 0, 2, 4, and 10 meters radial distances from the detector position. This sampling design is shown in Figure 4.

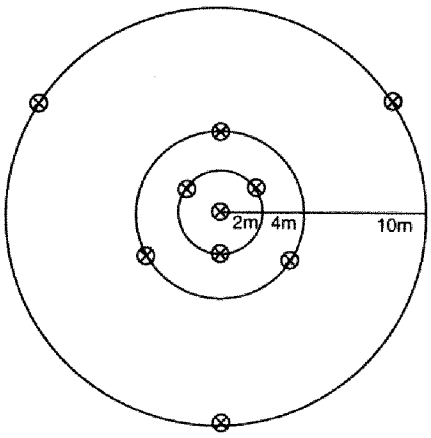

Figure 4. Soil sampling design.

This sampling approach provided radial coverage of the field of view seen by the HPGe detector placed at one meter above ground. The approach placed no particular weighting on any of the points. The sampling devices used were stainless steel core samplers pictured in Figure 5 below.

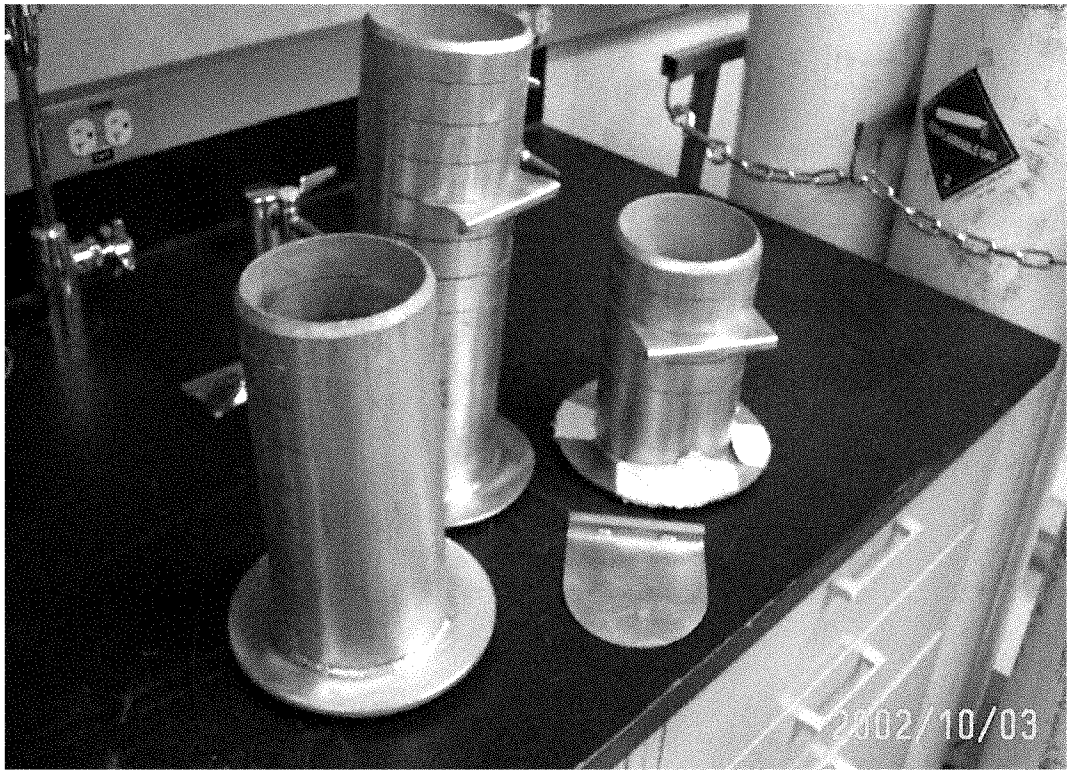

Figure 5. Depth discrete soil samplers.

These samplers were sleeved at 5.08-cm (2-in.) increments and were manually driven into the soil until the top of the sampler was flush with the ground surface. The area around the sampler was then hand excavated and the sampler was removed. The cores were carefully placed into plastic bags and the bags labeled with the point location and depth fraction. Samples were taken at 5.08-cm (2-in.) increments to a depth of 20.3 cm (8 in.). After completing all sampling at a location, individual samples were composited by depth fraction using a single large bag and manual mixing for several minutes. A final depth composite was then collected from this mix and placed into a plastic puck container. This container was then sent to the INEEL Radiation Measurements Laboratory (RML) located at the Test Reactor Area where it was analyzed for Cs-137 using standard laboratory gamma ray spectrometry. The RML had previously calibrated a HpGe spectrometer using a National Institute of Standards and Technology-traceable soil puck standard.

5. RESULTS AND DISCUSSION

5.1 Global Positioning Radiometric Scanner Survey Results

The GPRS was used to survey the areas around the ARA sites according to resident protocol. The 2002 GPRS survey results shown in Figure 6. The 2002 survey values are consistent with 1998 GPRS survey results at ARA as shown in Figure 7 with the exception of an area located on the southeast corner of the ARA-I facility. The 2002 GPRS survey shows elevated concentrations in this area over those shown in the 1998 survey map. This is attributed not to an increase in Cs-137 contamination in the soils,

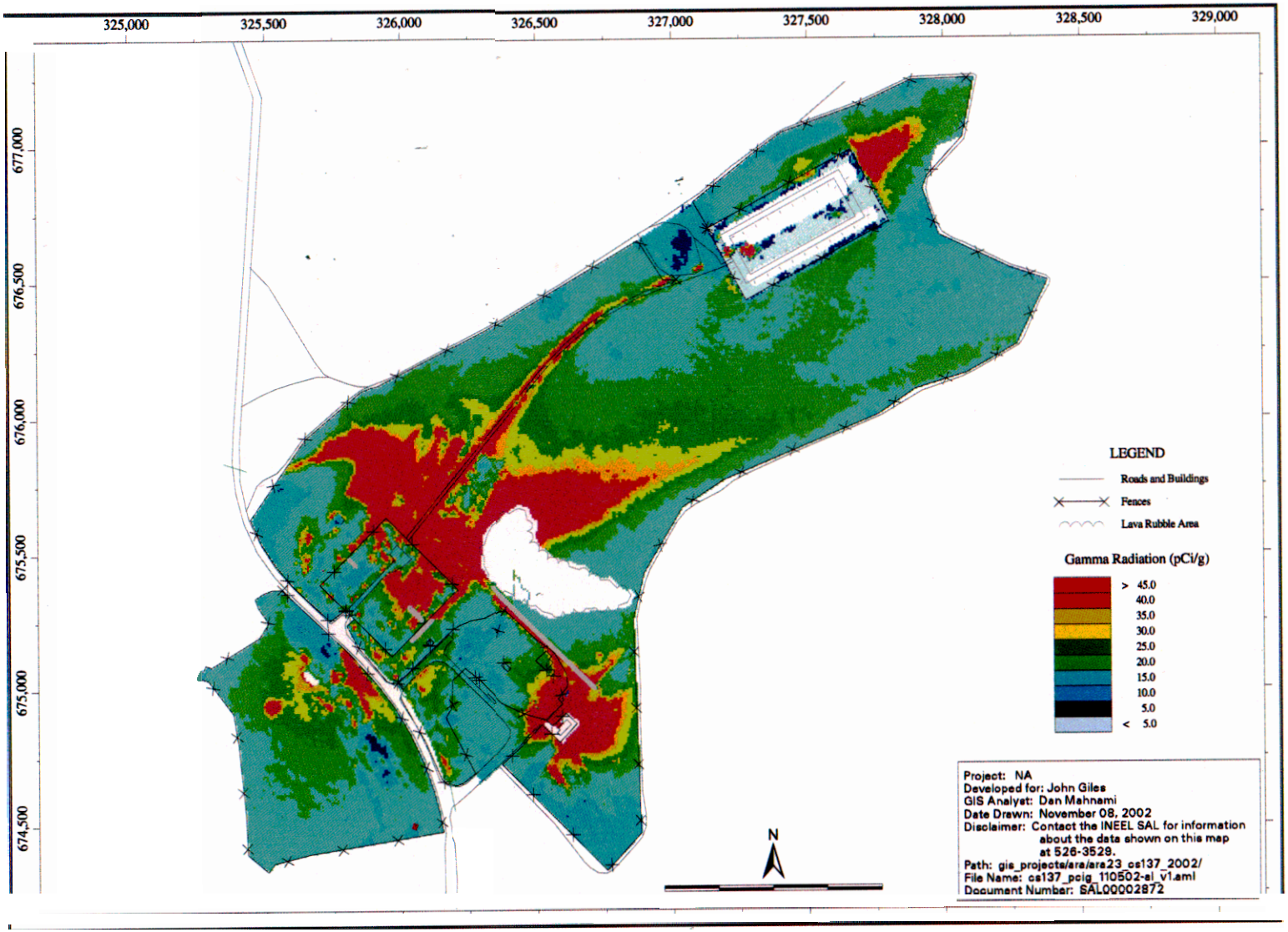

Figure 6. 2002 GPRS gamma survey results.

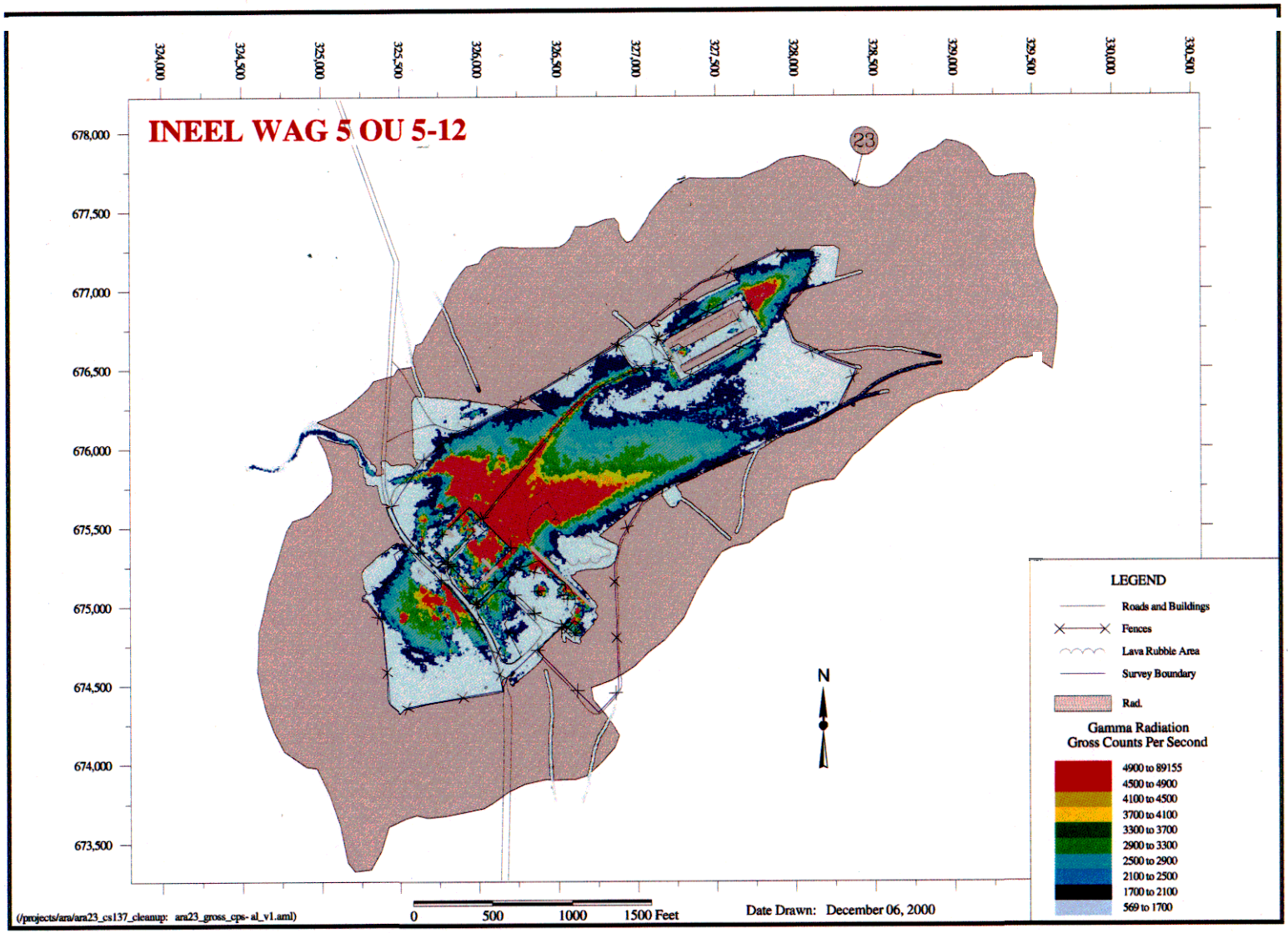

Figure 7. 1998 GPRS gamma survey results.

but rather to elevated background that attributed to the high-integrity container in which the sludge waste from the ARA-16 Radionuclide Tank is stored. The elevated readings in this area, as shown in the 2002 GPRS survey map, roughly encircle the CERCLA storage units that are located at the ARA-I facility. The 1998 GPRS survey results are more representative of the actual soil contamination in this vicinity. These figures show the utility of the GPRS surveys (i.e., the GPRS unit can rapidly cover a large area and provide very useful count rate information). This information can be used to determine measurement locations for the HPGe system in order to ascertain the source of elevated activity areas.

5.2 HPGe Measurement Results

Tables 1-1 through 1-5 in Attachment 1 show the results of the general one-meter HPGe measurements taken at the ARA sites. These values were all calculated assuming a uniform depth profile in the M1 software. The soil concentrations ranged from 0.5 ±0.1 pCi/g inside the former ARA II facility, to 133 ±0.2 pCig in the equipment turnaround area located northeast of the SL-1 burial ground. A summary of the data is shown in Table 1.

Table 1. Summary of HPGe measurements at ARA-23 sites.

Area	Mean Cs-137 (pCi/g)	Standard Deviation
Haul Road	45.8	42.3
Turnaround	45.4	43.6
Equipment Washdown	16.7	12.2
ARA II East	20.5	28.2
ARA II West	4.2	3.8

As can be seen from the standard deviations listed in Table 2, there is a large variance in the data sets, indicating that the contamination is heterogeneous in nature.

5.3 HPGe and Physical Core Sample Depth Profile Results

For the ARA sites, historical knowledge dictated the use of either uniform or exponential profiles in calculating the Cs-137 concentrations as measured with the HPGe system. Additionally, the accuracy of the results of standard in situ gamma ray spectrometry measurements is partially limited by the fact that the method is based on the assumption of the amount of attenuation of the gamma radiation by the soil. The magnitude of the attenuation is a function of the depth distribution of the radionuclide. Several different methods have been proposed to determine the magnitude of this attenuation for different contaminant distributions (ICRU 1994). This is very important since the calculated Cs-137 concentration in the soils is greatly affected by the assumed depth distribution. The methods used for this work were:

(1) *In Situ HPGe Measurements* – Using the calculated concentrations of Cs-137 derived from primary photons with different energies (32 and 662 keV). In essence, the differential attenuation of the unscattered radiation at different energies from the Cs-137 helps provide an estimate of the depth profile. Acquired spectra were analyzed using five different α/ρ values in order to provide an iterative and to better estimate the true source distribution at this site. Table 2 shows the values of the α/ρ values and the calculated relaxation lengths for Cs-137 that were used in this work.

Table 2. Values of α/ρ used in the M1 analysis protocol for this work.

M1 Profile	α/ρ Value	Relaxation Depth (in.)
Uniform	0.0000	
Exponential	0.0625	3.900
Exponential	0.3100	0.800
Exponential	6.2500	0.040
Planar	infinite	0

In order to compare iterated values of Cs-137 using this technique, 10 points were selected from an original 50-point data set, and spectra were acquired for up to 9600 seconds live time. Long count times were chosen in order to improve counting statistics, particularly at 32 keV. The spectra were then analyzed using the five α/ρ values provided in Table 1, and the results are presented in Attachment 1, Tables 1-6 and 1-7.

(2) *Depth Discrete Core Sampling* – Determination of the source depth profile or distribution at the ARA site was also determined using a conventional hammer coring technique. Use of this technique was advantageous since placement of the corer into the soil determined the sampling area and samples were taken with little possibility of cross contamination. The samples were analyzed for Cs-137 using laboratory based gamma ray spectrometry. For the soil cores, plots of the concentration of Cs-137 with depth showed the depth penetration factor. This was accomplished by computing the total activity in the core and then plotting the fraction of the total activity below a given depth versus that depth. The depth was plotted in terms of mass per unit area. Linear fits to these plots provided slopes that are the α/ρ depth penetration parameters.

Table 3 shows the alpha/rho values, which are the slopes of the lines in Figure 8. Assuming a uniform density of 1.5 g/cm^3 for the ARA soils, the estimated relaxation lengths were calculated and these are also shown in Table 3.

Table 3. Computed alpha/rho and relaxation lengths for ARA-23 sites.

Point	Alpha/RHO	Relax Length (in.)
Area 4-6	1.31	0.2
Area 1-4	1.72	0.2
Area 2-4	0.29	0.9
HR-6	1.01	0.3
HR-8	1.11	0.2
Area 2-6	0.82	0.3
Area 2-8	0.28	0.9
Area 2-10	0.91	0.3
Area 4-1	1.07	0.2
Area 4-5	1.78	0.1

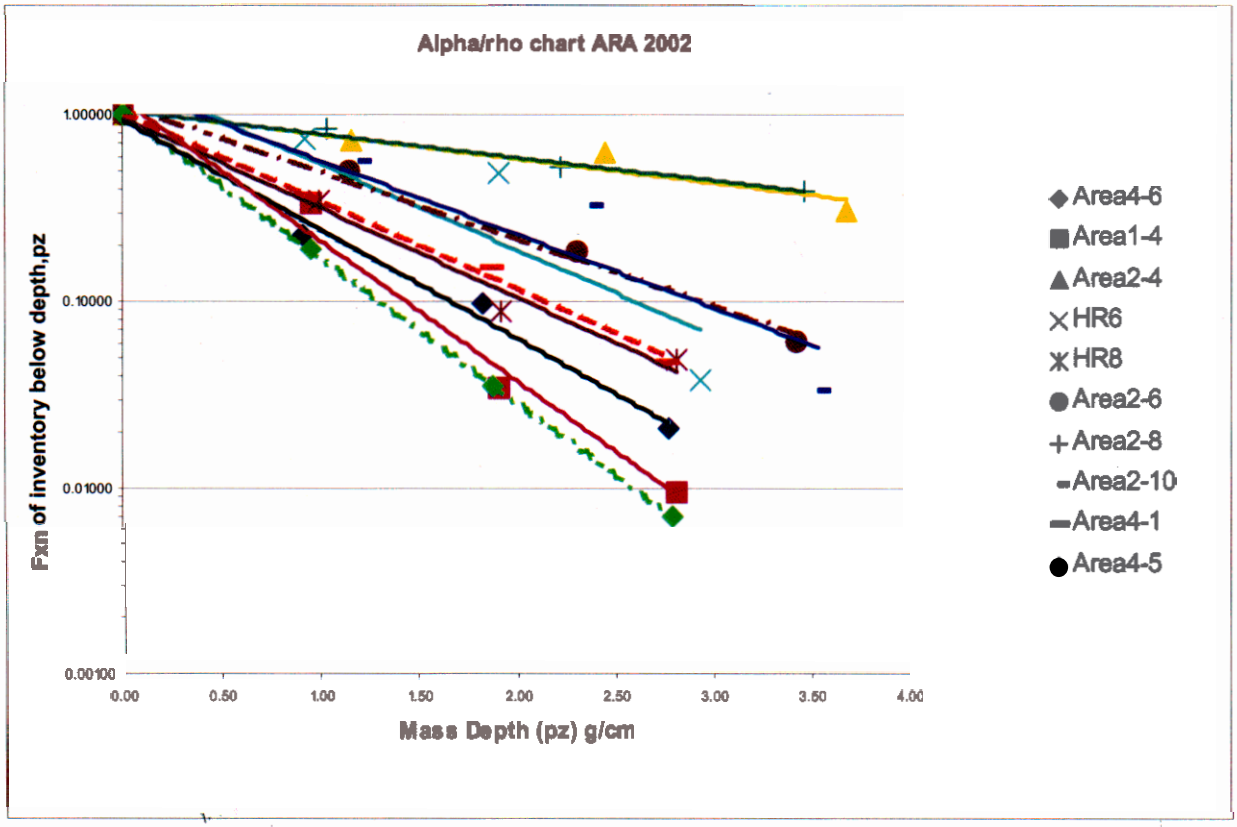

Figure 8. Depth penetration plots for ARA-2002.

Note that the relatively high α/ρ values translate to small relaxation length values. This indicates a fairly shallow depth penetration of Cs-137 for most ARA soil sites. Area 2-8 and Area 2-4 values show the greatest Cs-137 penetration while all of the other points show very shallow Cs-137 penetrations. The values for Area 4-6, 4-1, and 4-5 are similar, indicating that the depth penetration for that part of the ARA site (equipment washdown area) is consistent over the area studied. HR-6 and HR-8 are also closely grouped and show similar depth distributions. In all cases the depth penetration appears to be near surface.

Examination of the data in Attachment 1, Table 1-6, shows that as the α/ρ values are increased, the relative agreement in the high (662 keV) and low (32 keV) energy gamma rays improves. Use of increasing α/ρ values tends to minimize the difference between the Cs-137 concentrations predicted by the 662 keV gamma rays and the 32 keV x-ray lines. Use of increasing α/ρ values indicates a shallow source distribution; this agrees with the conclusion from the soil core data. This means that the M1 analysis software used at the INEEL for this work has some potential for estimating depth profiles. There are, however, some limitations. One limitation is the presence of overburden materials (such as may be encountered inside the ARA II facility boundary) that effectively eliminate the 32 keV detection probability. In those cases, this technique is not valid. Another limitation occurs when the concentration of Cs-137 is too low to attain the necessary counting statistics within a reasonable (i.e., 1-hour) count time.

Use of both in situ gamma measurement and soil core analyses indicates that the Cs-137 penetrations at the ARA sites is shallow. However, it must be noted that although the data indicate a shallow distribution, Cs-137 concentrations below the calculated relaxation length depths can be greater

than the remedial action goal of 23 pCi/g as shown by the soil core data. Based on the results of this study, use of the in situ HPGe during the remediation of the ARA-23 site will aid in directing the depth of excavation, thereby helping to minimize the amount of soils excavated and removed for disposal and reducing overall project costs.

6. REFERENCES

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Attachment 1

In Situ HPGe and Soil Core Sample Data

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Table 1-1. Locations and Cs-137 values (pCi/g, 2-sigma uncertainty) at ARA haul road.

ID	East	North	Cs-137	UNC +/-	Dead Time %
HR-1	327138.9	676541.6	1.7	0.1	2.9
HR-2	326982.4	676487.3	19.2	0.3	3.8
HR-3	326835.6	676425.4	6.2	0.1	1.3
HR-4	326698.8	676340.4	19	0.1	5.6
HR-5	326577.6	676234.8	31.4	0.4	7.2
HR-6	326474.9	676116.3	14.6	0.2	7.8
HR-7	326374.9	675992.3	74.5	0.6	10.6
HR-8	326273.4	675866.3	71.8	0.5	9.4
HR-9	326172	675740.6	122.1	0.7	14
HR-10	326071.8	675616.3	97.1	0.6	21.9

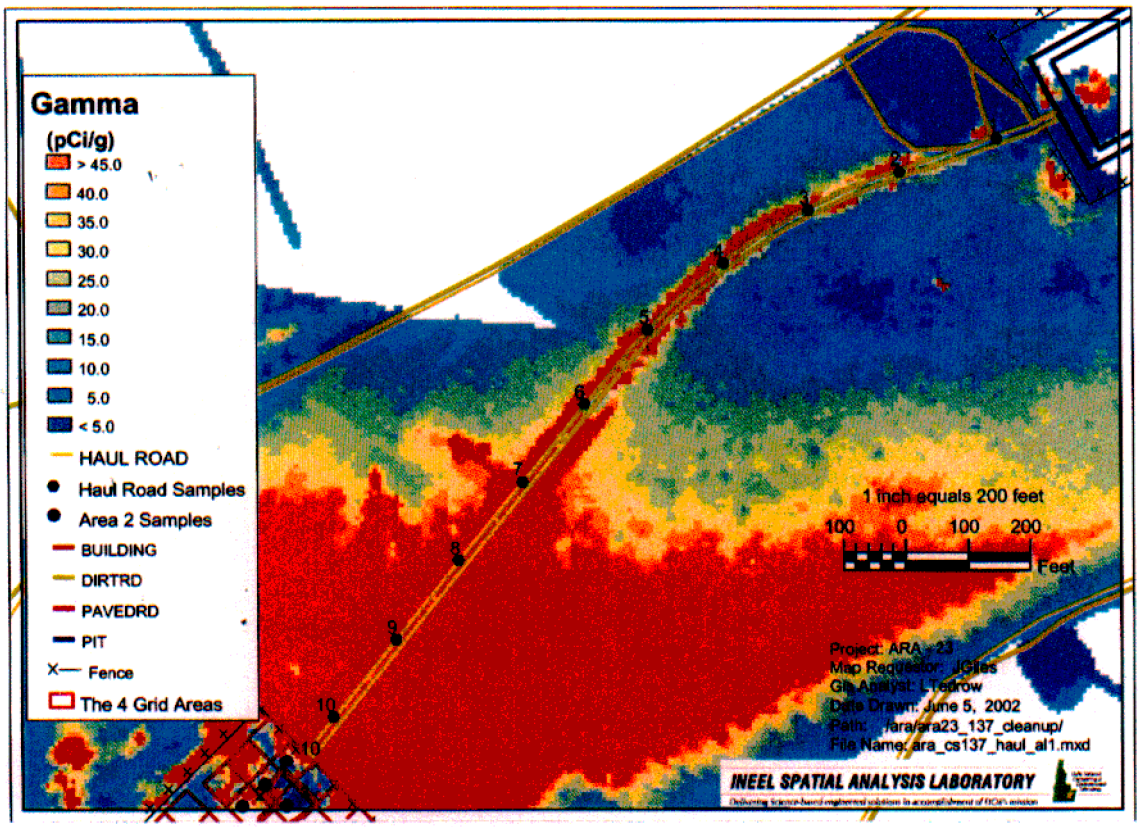

Table 1-2. Locations and Cs-137 values (pCi/g, 2-sigma uncertainty) at ARA-23 turnaround area.

ID	East	North	Cs-137	UNC +/-	Dead Time %
Area1-1	327782.4	677021.0	133.0	0.2	11.7
Area1-2	327739.0	676996.2	93.5	0.6	8.6
Area1-3	327918.9	676984.1	19.6	0.3	3.4
Area1-4	327807.3	676977.7	89.1	0.7	8.2
Area1-5	327875.5	676959.2	20.8	0.3	3.6
Area1-6	327714.1	677039.5	26.0	0.3	4.4
Area1-7	327670.8	677014.7	38.5	0.4	5.0
Area1-8	327900.4	676915.8	12.5	0.3	3.0
Area1-9	327881.9	676847.6	11.1	0.1	3.4
Area1-10	327987.1	676965.6	10.3	0.2	3.9

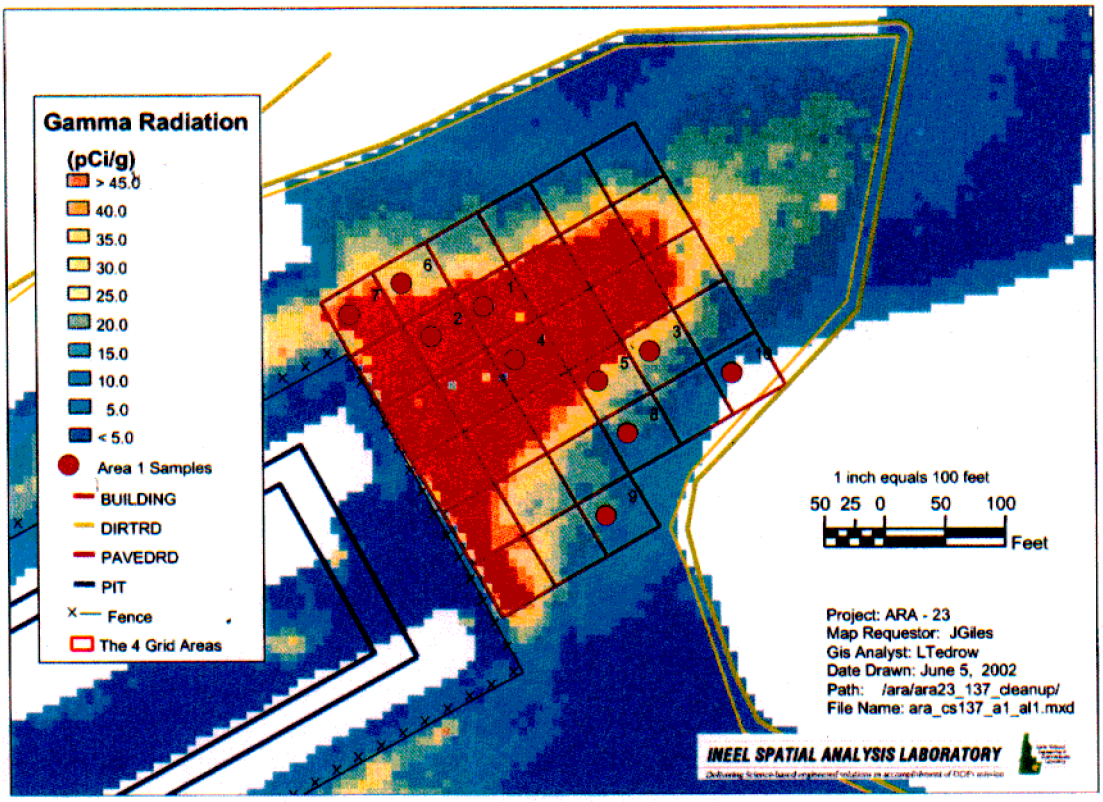

Table 1-3. Locations and Cs-137 values (pCi/g, 2-sigma uncertainty) at ARA-23 equipment washdown.

ID	East	North	Cs-137	UNC +/-	Dead Time %
Area 4-1	325660.1	674997.7	28.0	0.5	8.9
Area 4-2	325659.9	674927	22.2	0.3	3.9
Area 4-3	325695.9	675174.3	1.2	0.1	1.3
Area 4-4	325731.2	675138.9	2.5	0.1	1.6
Area 4-5	325589.6	675068.6	32.6	0.4	4.7
Area 4-6	325801.7	675068	35.0	0.3	4.1
Area 4-7	325766.2	675032.7	13.0	0.2	2.3
Area 4-8	325695.3	674962.2	15.6	0.2	2.7
Area 4-9	325766	674962	8.8	0.2	2.1
Area 4-10	325695.1	674891.5	8.4	0.2	2

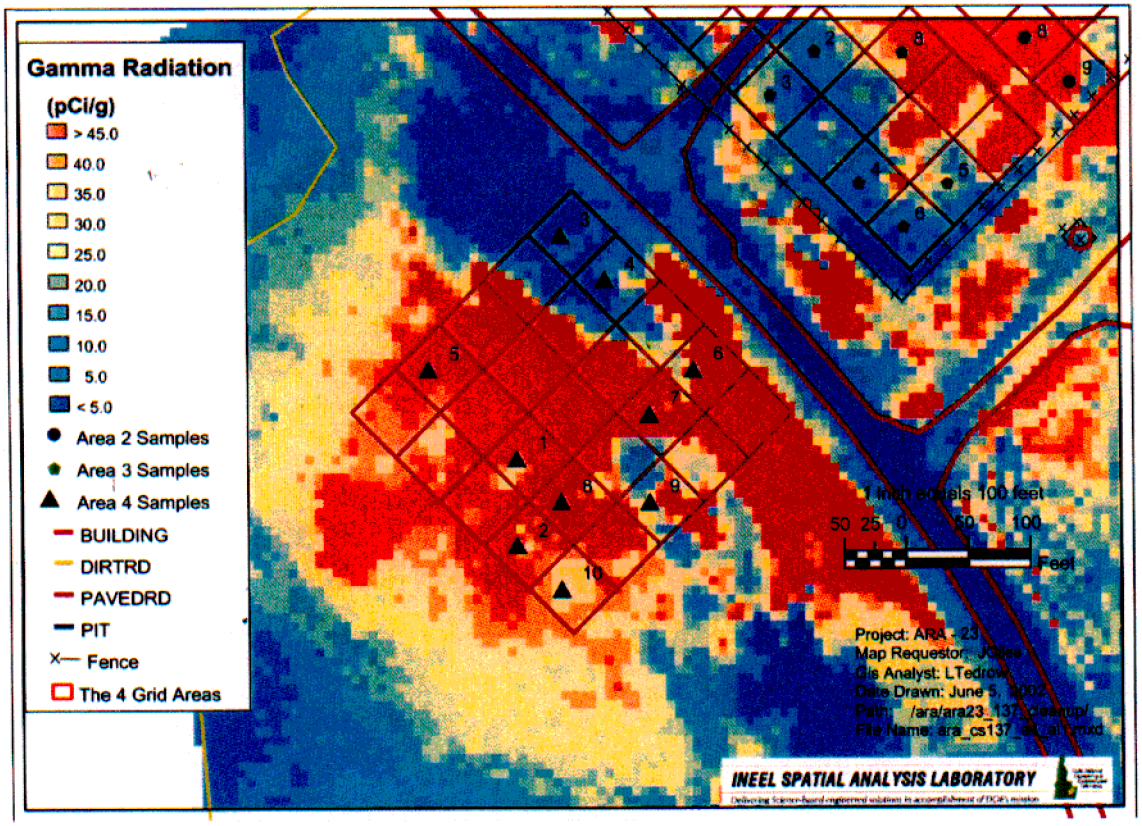

Table 1-4. Locations and Cs-137 values (pCi/g, 2-sigma uncertainty) at ARA II (west side).

ID	East	North	Cs-137	UNC +/-	Dead Time %
Area 3-1	325826.0678	675393.2	2.6	0.1	4
Area 3-2	325896.6098	675322.3	5.5	0.2	3.6
Area 3-3	325861.1703	675287.1	4.6	0.2	3.5
Area 3-4	325931.7123	675216.2	2.6	0.2	3.4
Area 3-5	326002.4227	675216	4.0	0.1	4.1
Area 3-6	325966.9833	675180.8	2.6	0.0	3.7
Area 3-7	325896.7783	675393.1	2.5	0.2	3.9
Area 3-8	325967.3203	675322.2	14.3	0.3	5
Area 3-9	325790.7968	675428.7	2.6	0.1	3.9
Area 3-10	325755.3573	675393.4	0.5	0.1	3.1

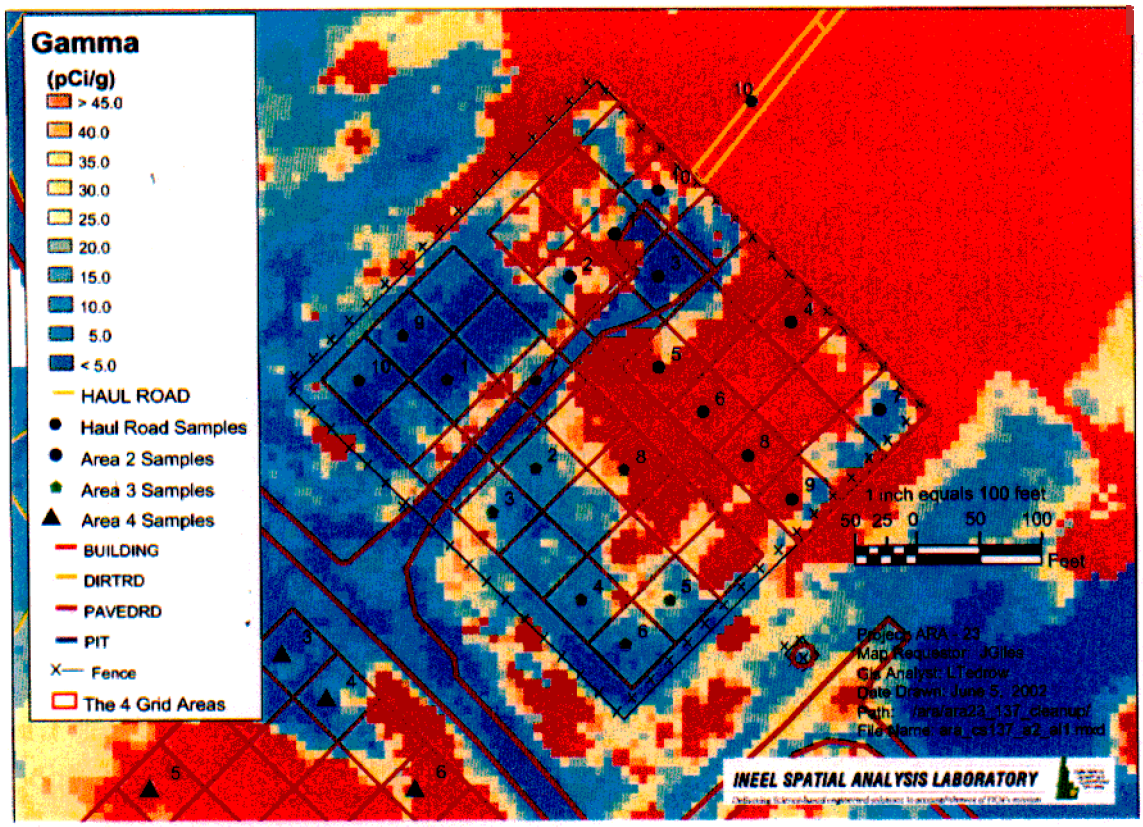

Table 1-5. Locations and Cs-137 values (pCi/g, 2-sigma uncertainty) at ARA II (east side).

ID	East	North	Cs-137	UNC +/-	Dead Time %
Area 2-1	325960.4	675509.7	6.7	0.2	4.9
Area 2-2	325925	675474.4	3.9	0.2	4.8
Area 2-3	325995.7	675474.2	1.9	0.1	4.5
Area 2-4	326101.7	675438.6	11.1	0.3	7.5
Area 2-5	325995.5	675403.5	28.9	0.4	6.6
Area 2-6	326030.8	675368.1	88.3	0.7	13.3
Area 2-7	326172.2	675367.7	2.9	0.2	4.7
Area 2-8	326066.1	675332.6	49.8	0.1	10.2
Area 2-9	326101.3	675297.2	5.7	0.2	7.6
Area 2-10	325995.9	675544.9	5.5	0.2	5.9

Table 1-6. Results of soil core analyses and multiple analyses of long counts at ARA locations.

ID	M1 Profile	Alpha/ RHO	Relax Depth (in.)	Cs-137 @662	2 sig	Cs-137 @32	2 sig	Mean Cs-137 @ 0-2"	sdev mean	Lab +/-	Mean Cs-137 @ 2-4"	sdev mean	Lab +/-	Mean Cs-137 @4-6"	sdev mean	Lab +/-	Mean Cs-137 @6-8"	sdev mean	Lab +/-
Area 4-6	UNF			100.0	0.2	116.1	5.8	92.9	36.2	0.8	16.5	5.8	0.2	20.2	27.7	0.2	6.7	9.0	0.2
	EXP	0.0625	3.900	74.7	6.2	649.5	21.5												
	EXP	0.3100	0.800	26.7	0.1	144.6	7.2												
	EXP	6.2500	0.040	10.7	0.9	21.8	0.8												
	PLN			˜ıı	˜ı	ıõ□	˜□												
Area1-4	UNF			133.3	0.2	139.5	2.4	42.1	29.2	0.4	14.2	16.2	0.3	0.8	0.4	0.1	0.6	0.3	0.1
	EXP	0.0625	3.900	97.8	0.1	72.4	12.1												
	EXP	0.3100	0.800	34.9	0.1	160.0	2.7												
	EXP	6.2500	0.040	14.4	0.1	26.7	0.5												
	PLN			11.9	0.1	15.8	0.3												
Area 2-4	UNF			11.9	0.5	36.7	2.6	3.4	3.9	0.1	1.3	1.5	0.1	1.0	na	na	0.2	na	na
	EXP	0.0625	3.900	9.3	0.5	275.0	15.0												
	EXP	0.3100	0.800	3.3	0.1	47.9	3.3												
	EXP	6.2500	0.040	1.4	0.1	7.9	0.5												
	PLN			1.1	0.1	4.7	0.3												
HR-6	UNF			17.5	0.5	22.5	1.4	20.0	19.0	0.3	17.1	22.8	0.2	6.9	7.0	0.1	2.7	2.1	0.1
	EXP	0.0625	3.900	14.4	0.4	137.0	8.4												
	EXP	0.3100	0.800	5.2	0.2	30.6	1.9												
	EXP	6.2500	0.040	2.1	0.1	5.1	0.3												
	PLN			1.9	0.1	3.1	0.2												
HR-8	UNF			92.2	0.1	69.1	2.8	38.7	28.7	0.4	16.6	19.5	0.2	2.5	0.8	0.1	3.0	2.9	0.1
	EXP	0.0625	3.900	<1	NA	<313	NA												
	EXP	0.3100	0.800	24.6	0.1	86.1	3.5												
	EXP	6.2500	0.040	10.2	0.1	14.3	0.6												
	PLN			9.3	0.3	9.2	0.2												

ID	M1 Profile	Alpha/ RHO	Relax Depth (in.)	Cs-137 @662	2 sig	Cs-137 @32	2 sig	Mean Cs-137 @ 0-2"	sdev mean	Lab +/-	Mean Cs-137 @ 2-4"	sdev mean	Lab +/-	Mean Cs-137 @4-6"	sdev mean	Lab +/-	Mean Cs-137 @6-8"	sdev mean	Lab +/-
Area 2-6	UNF			107.2	0.2	114.1	2.2	168.8	144.1	1.0	105.9	67.7	41.1	53.7	0.4	32.5	37.6	0.3	0.2
	EXP	0.0625	3.900	97.6	0.1	544.9	286.0												
	EXP	0.3100	0.800	34.9	0.1	121.3	6.4												
	EXP	6.2500	0.040	14.4	0.2	20.1	1.1												
	PLN			13.2	0.1	13.1	0.7												
Area 2-8	UNF			6.7	0.1	28.3	1.5	2.4	1.3	0.1	4.6	3.7	0.2	1.9	1.9	0.2	5.3	8.1	0.2
	EXP	0.0625	3.900	5.0	0.1	158.0	8.2												
	EXP	0.3100	0.800	1.8	0.1	39.8	2.0												
	EXP	6.2500	0.040	0.8	0.1	7.2	0.4												
	PLN			0.7	0.1	3.9	0.2												
Area 2-10	UNF			6.4	0.1	29.3	1.5	0.5	0.3	0.1	0.2	0.2	0.2	0.4	0.5	0.2	0.2	0.2	p
	EXP	0.0625	3.900	4.8	0.3	184.0	8.1												
	EXP	0.3100	0.800	1.8	0.1	39.8	2.0												
	EXP	6.2500	0.040	0.8	0.1	7.2	0.4												
	PLN			0.7	0.1	4.0	0.2												
Area 4-1	UNF			8.0	0.1	7.2	1.2	18.7	6.9	0.2	7.9	11.1	0.3	3.3	5.6	0.3	1.9	23.9	0.4
	EXP	0.0625	3.900	6.0	0.5	40.3	6.8												
	EXP	0.3100	0.800	2.3	0.1	9.8	1.7												
	EXP	6.2500	0.040	1.0	0.1	1.8	0.2												
	PLN			0.8	0.1	1.0	0.1												
Area 4-5	UNF			41.6	0.1	45.7	1.4	21.5	16.6	0.3	4.3	2.7	0.2	0.8	1.0	0.1	0.2	0.2	0.2
	EXP	0.0625	3.900	30.7	0.5	255.5	7.6												
	EXP	0.3100	0.800	11.7	0.1	61.9	1.8												
	EXP	6.2500	0.040	5.1	0.1	11.2	0.3												
	PLN			4.1	0.1	6.1	0.2												